

High Duty Cycle, Extended Operation Constant Volume Combustion Engine, Phase I

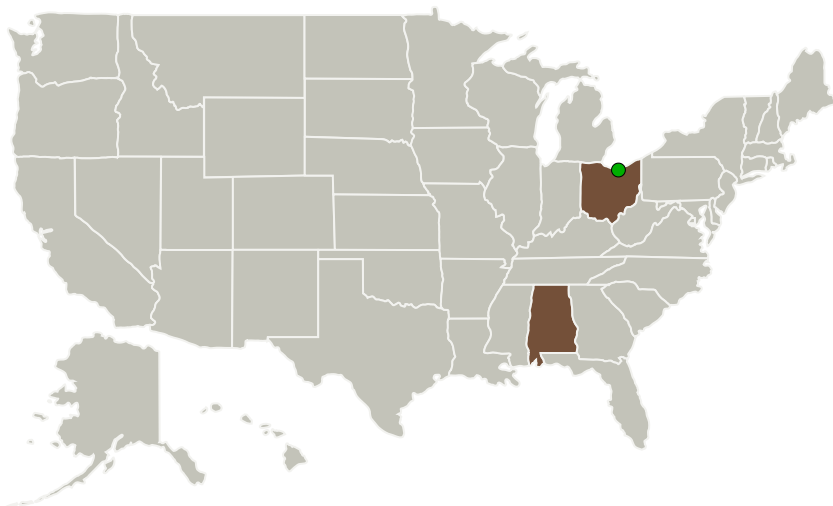
Completed Technology Project (2011 - 2011)



Project Introduction

The Science Mission Directorate is chartered with answering fundamental questions requiring the view from and into space. Its future direction will be moving away from exploratory missions (orbiters and flybys) into more detailed/specific exploration missions that are at or near the surface of planets and small bodies (landers, rovers, and sample returns) or at more optimal observation points in space. This drives a need for propulsion technologies that enable precision landing, hazard avoidance, in-space rendezvous, and ascent/decent vehicle propulsion. These missions will entail higher propulsion system duty cycles, more challenging environmental conditions, and extended operation. Moreover, propulsion system objectives will need to be met with more stringent constraints on mass, volume, power, and cost. C3 Propulsion proposes the development of an advanced CV engine prototype featuring an innovative combination of multiple throttling techniques to enable sustained deep throttling without sacrificing engine performance. The Constant Volume combustion engine is an innovative design that combines light weight, low pressure fuel tanks and operates at high chamber pressures. The CV engine has nearly identical specific impulse as a constant pressure engine with the same mass flow and throat area, furthermore, the nozzle optimizes at the same area ratio. It has exceptional thrust-to-weight ratios. It will be designed for high duty cycle, extended operation to satisfy SMD mission requirements. The suitability of this engine for a range of SMD missions will be proven through engine testing that demonstrates deep throttling capability, and the development of appropriate scaling laws that allow engine sizing to be performed based on mission requirements.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Streamline Automation, LLC	Lead Organization	Industry	Huntsville, Alabama
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Alabama	Ohio

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Summary: High Duty Cycle, Extended Operation Constant Volume Combustion Engine, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/138192>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Streamline Automation, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

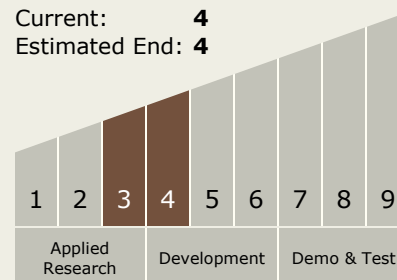
Carlos Torrez

Principal Investigator:

Roberto Disalvo

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.1 Chemical Space Propulsion
 - └ TX01.1.3 Cryogenic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System